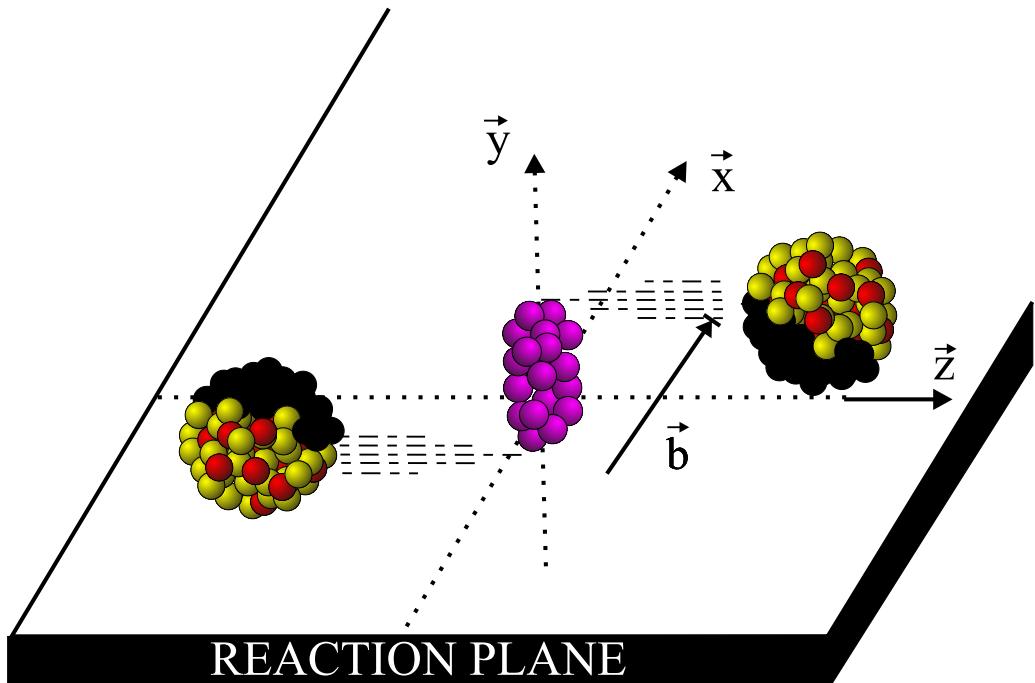


Event anisotropy at RHIC



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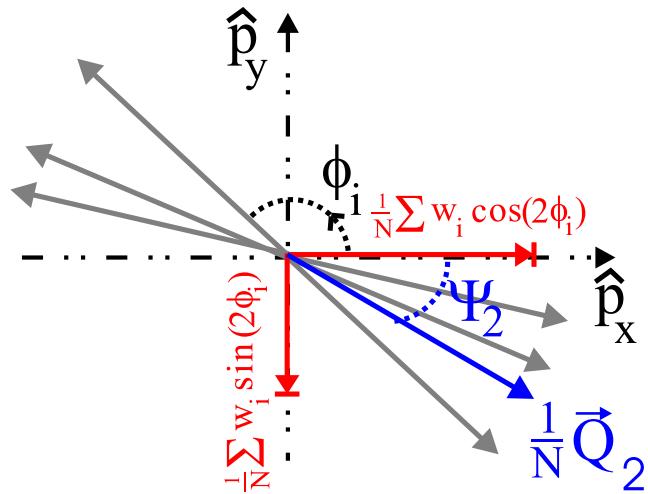
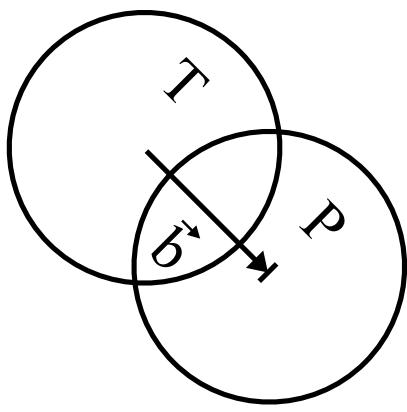
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Motivation and definitions

- Event plane reconstruction:

$$E \frac{d^3 N}{d^3 p} = \frac{1}{2\pi} \frac{d^2 N}{p_t dp_t dy} \left(1 + \sum_{n=1}^{\infty} 2v_n \cos[n(\phi - \Psi_r)] \right)$$



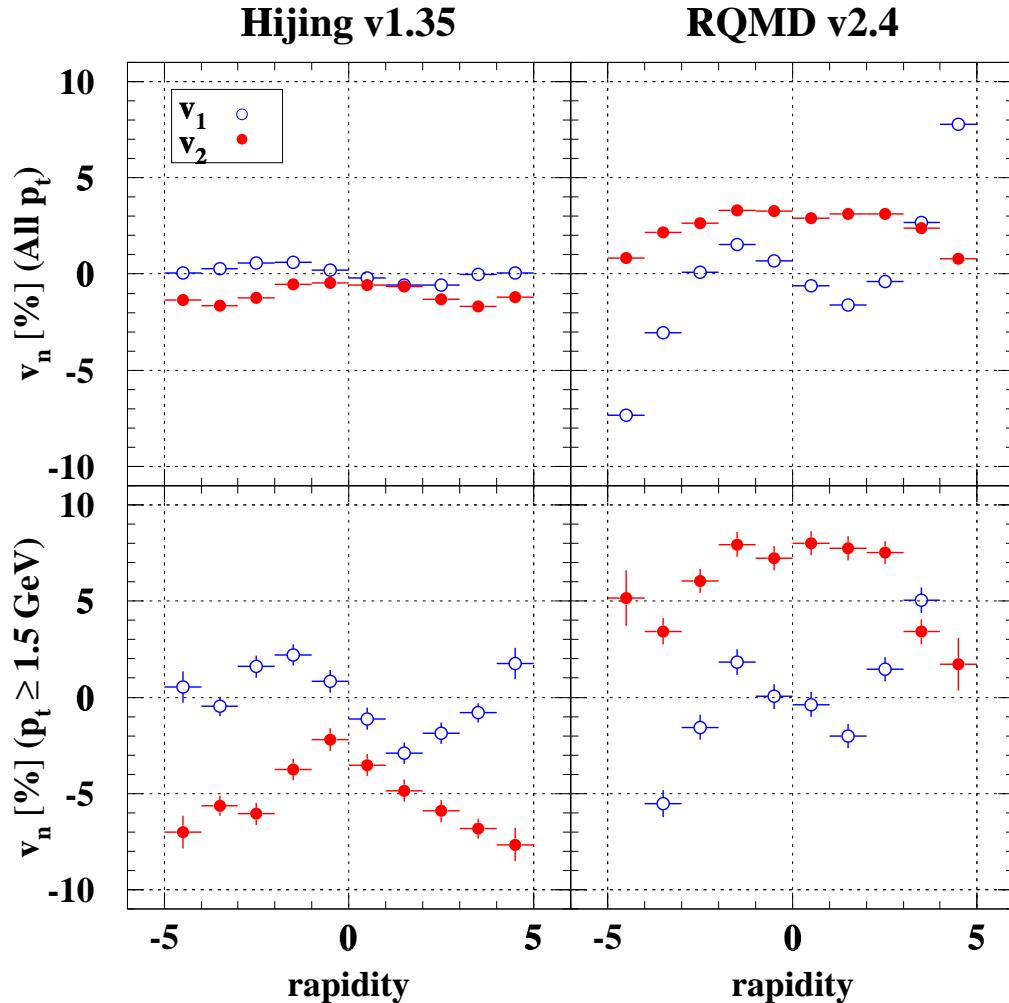
$$Q_n \cos(n\Psi_n) = \sum_i^N w_i \cos(n\phi_i), \quad Q_n \sin(n\Psi_n) = \sum_i^N w_i \sin(n\phi_i)$$

$$\Psi_n = \frac{1}{n} \left(\tan^{-1} \frac{\sum_i^N w_i \sin(n\phi_i)}{\sum_i^N w_i \cos(n\phi_i)} \right)$$

- Observables with respect to the reaction plane:

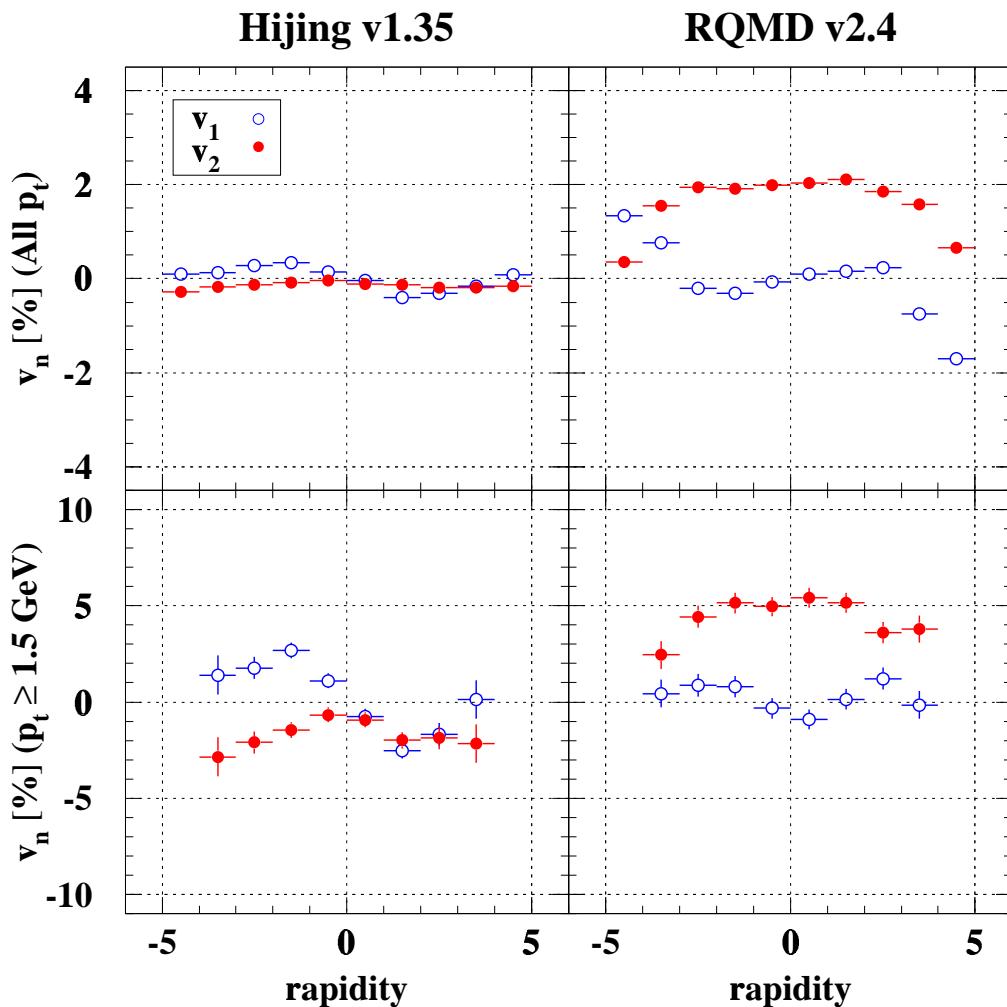
- Anisotropic flow \Rightarrow thermalization?, QGP?, jet quenching?, DCC?
- HBT \Rightarrow expanding source?

v_1, v_2 for protons + neutrons



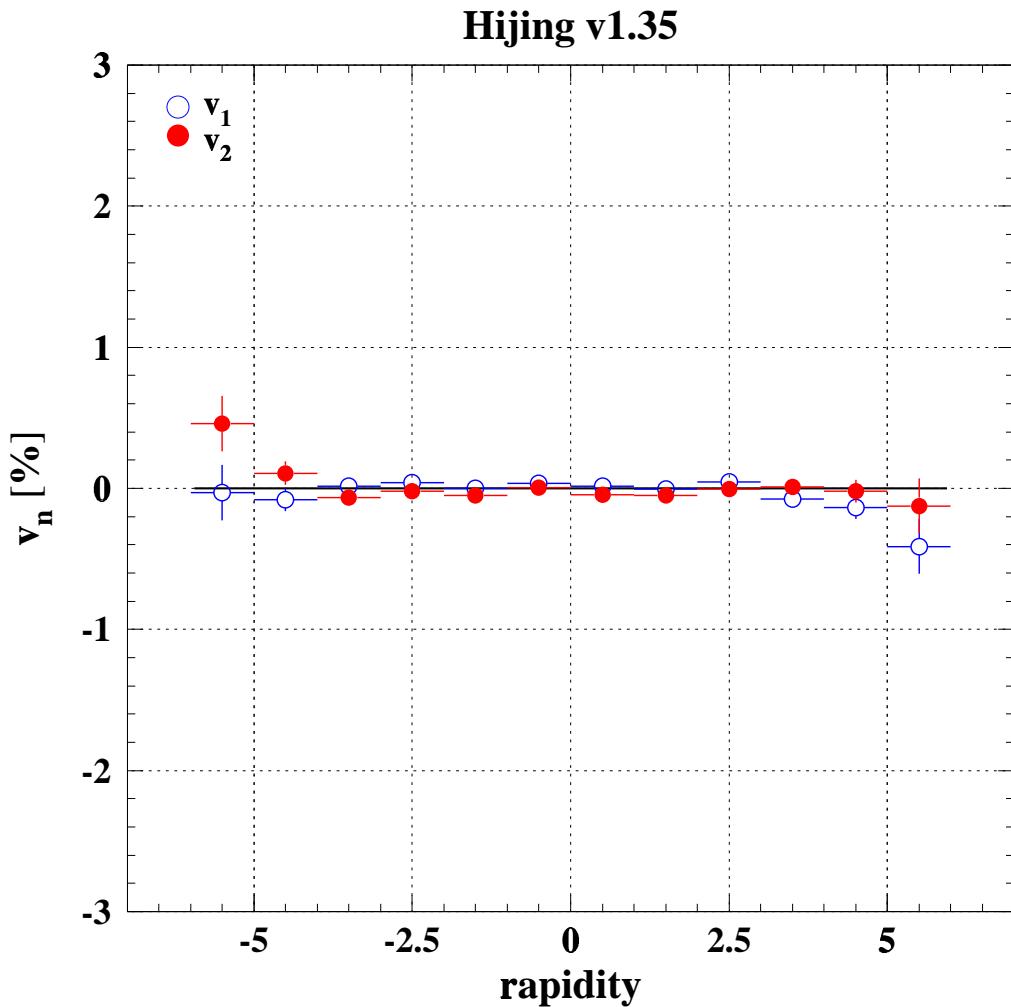
$$v_n = <\cos[n(\phi - \Psi_r)]>$$

v_1, v_2 for $\pi^+ + \pi^-$



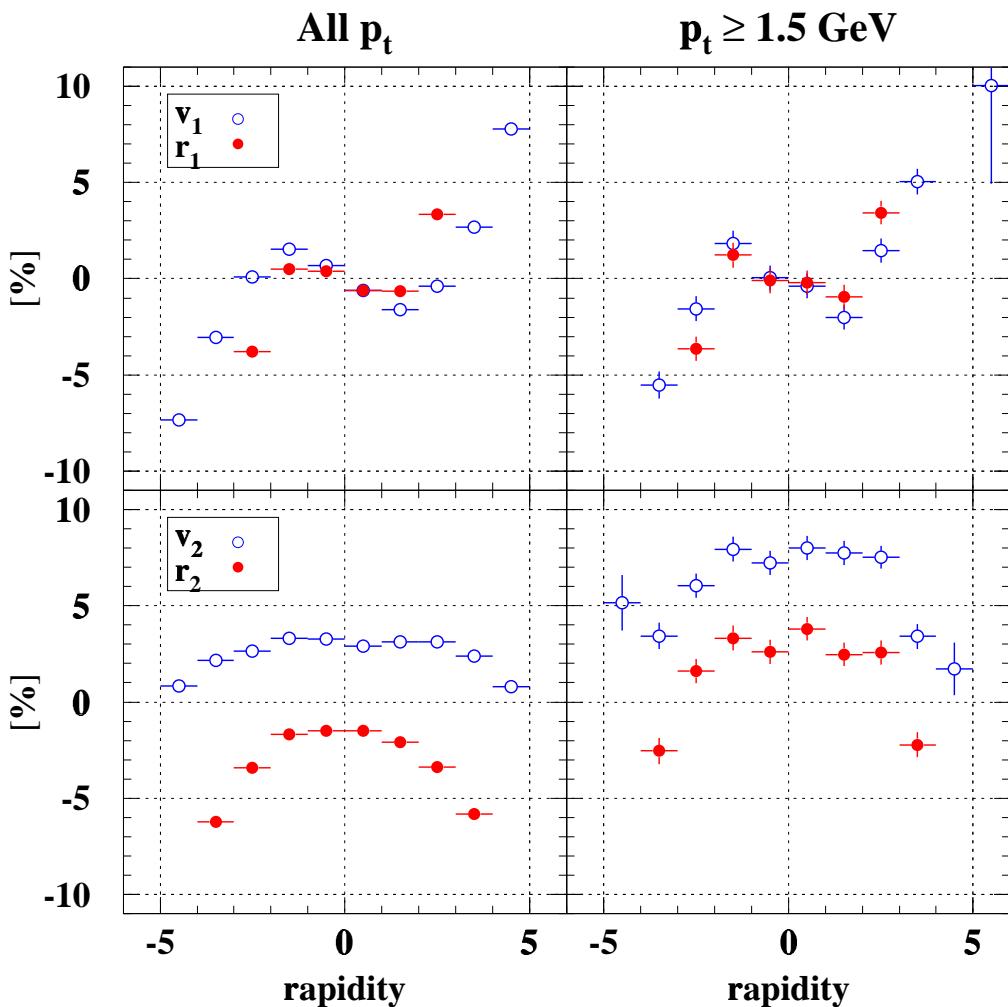
$$v_n = \langle \cos[n(\phi - \Psi_r)] \rangle$$

v_1, v_2 for $\pi^+ + \pi^-$, Hijing no jet quenching



$$v_n = <\cos[n(\phi - \Psi_r)]>$$

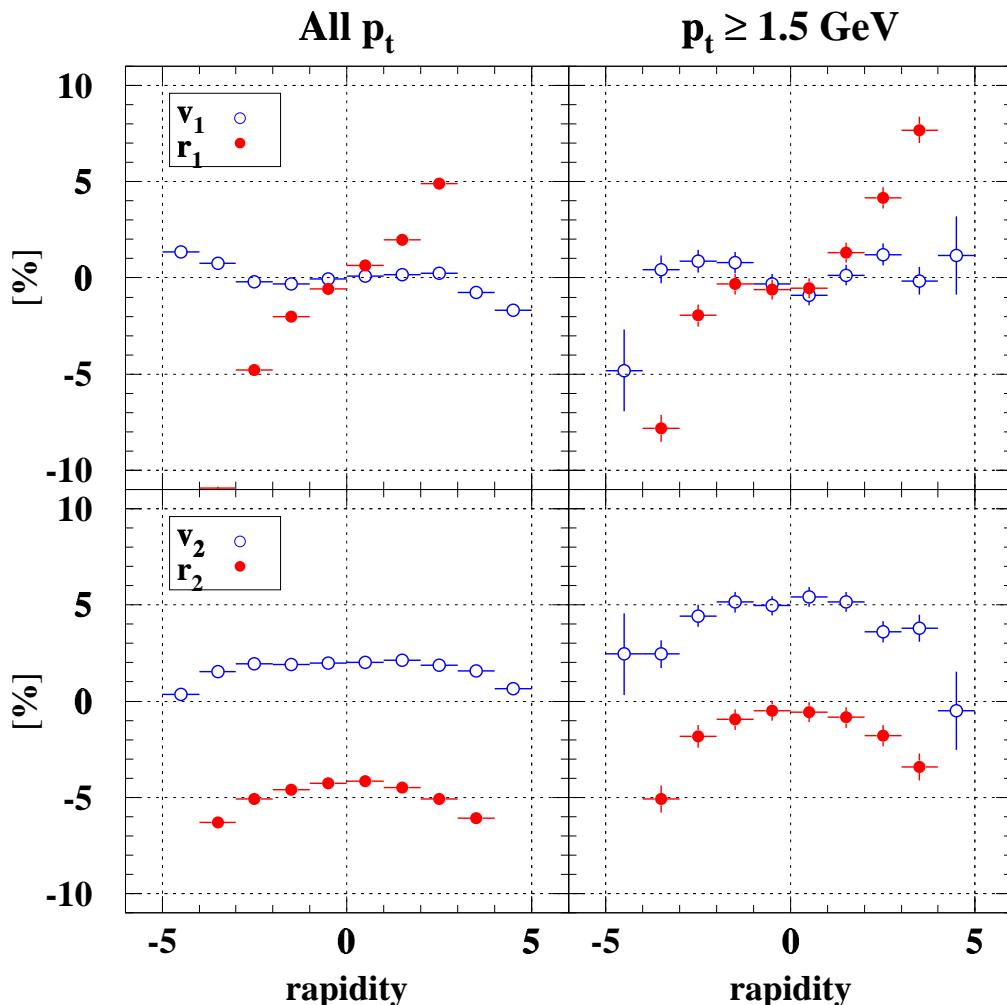
v_1, r_1 and v_2, r_2 for protons and neutrons



$$v_n = \langle \cos[n(\phi - \Psi_r)] \rangle$$

$$r_n = \langle \cos[n(\arctan(\frac{y}{x}) - \Psi_r)] \rangle$$

v_1, r_1 and v_2, r_2 for $\pi^+ + \pi^-$

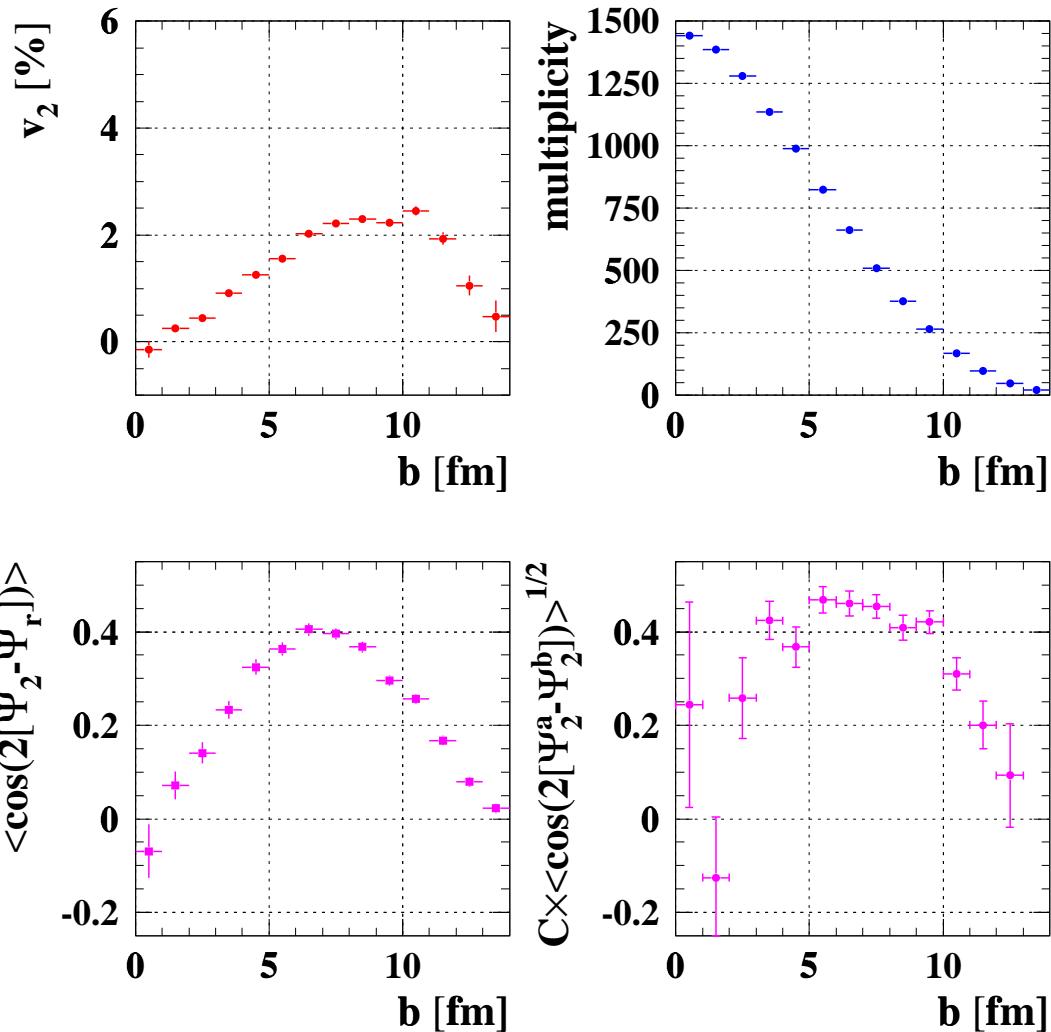


$$v_n = \langle \cos[n(\phi - \Psi_r)] \rangle$$

$$r_n = \langle \cos[n(\arctan(\frac{y}{x}) - \Psi_r)] \rangle$$

Event plane resolution (v_2 , $\pi^+ + \pi^-$, TPC)

RQMD v2.4, Au+Au 100 AGeV (pions, $-1.5 \leq Y \leq 1.5$)

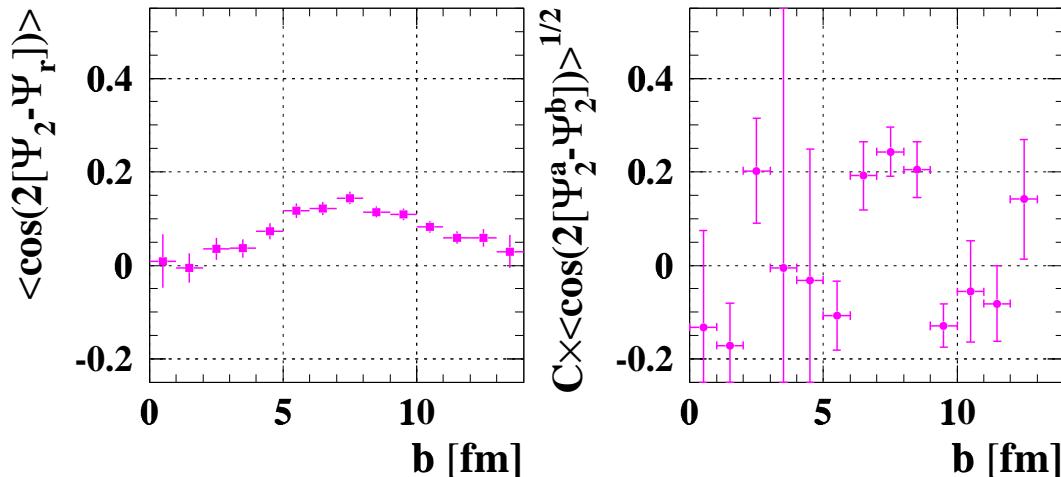
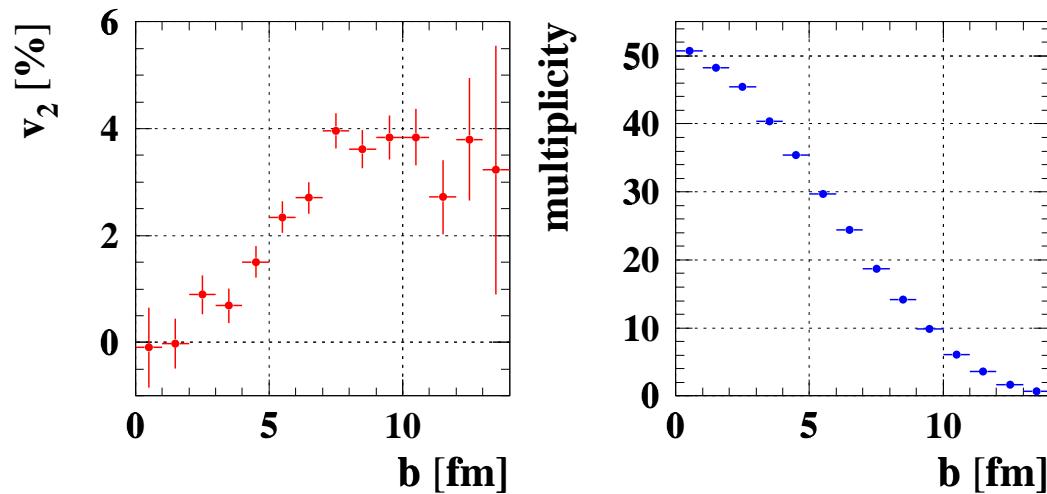


$$v_n = \frac{v_n^{\text{obs}}}{\langle \cos[n(\Psi_n - \Psi_r)] \rangle}$$

$$\langle \cos[n(\Psi_n^a - \Psi_r)] \rangle = \sqrt{\langle \cos[n(\Psi_n^a - \Psi_n^b)] \rangle}$$

Event plane resolution (v_2 , protons, TPC)

RQMD v2.4, Au+Au 100 AGeV (protons, $-1.5 \leq Y \leq 1.5$)

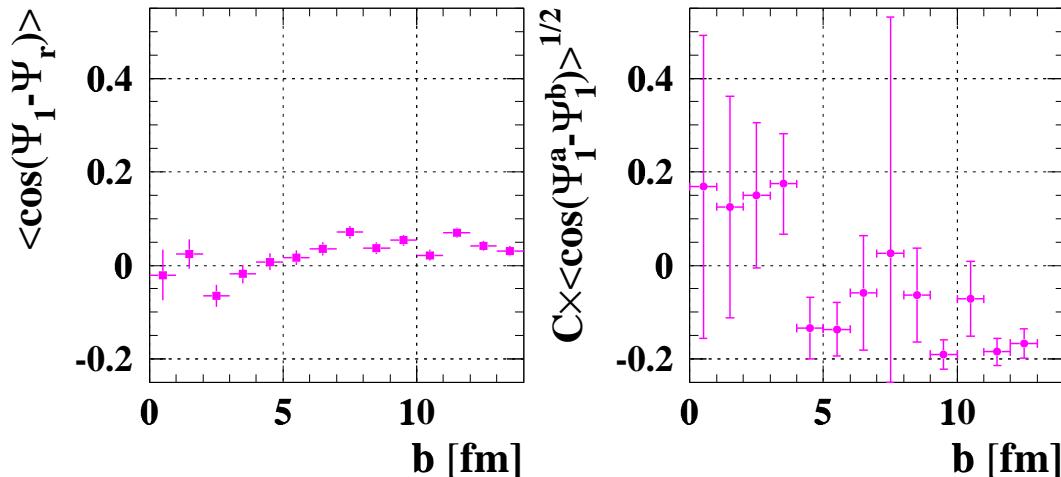
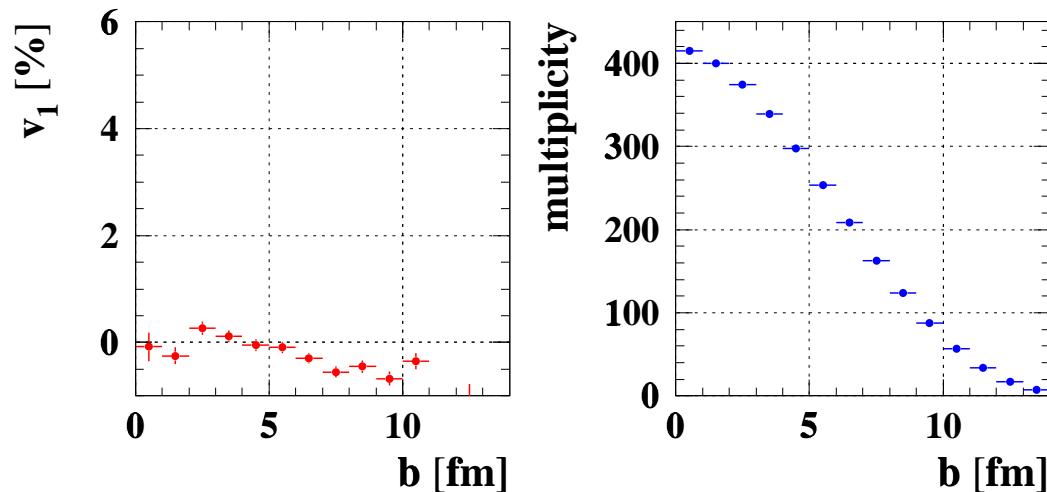


$$v_n = \frac{v_n^{\text{obs}}}{\langle \cos[n(\Psi_n - \Psi_r)] \rangle}$$

$$\langle \cos[n(\Psi_n^a - \Psi_r)] \rangle = \sqrt{\langle \cos[n(\Psi_n^a - \Psi_n^b)] \rangle}$$

Event plane resolution (v_1 , $\pi^+ + \pi^-$, FTPC)

RQMD v2.4, Au+Au 100 AGeV (pions, $2.5 \leq Y \leq 4.$)



$$v_n = \frac{v_n^{\text{obs}}}{\langle \cos[n(\Psi_n - \Psi_r)] \rangle}$$

$$\langle \cos[n(\Psi_n^a - \Psi_r)] \rangle = \sqrt{\langle \cos[n(\Psi_n^a - \Psi_n^b)] \rangle}$$



Summary / Conclusions

- Determining the event plane gives us v_n .
 - HBT with respect to the event plane gives us information on r_n .
 - Both these observables will be essential for understanding the physics of RHIC.
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- v_2 probably easily accessible in STAR TPC (40 000 RQMD events).
≤ 12 hours beam time at 1 Hz, real “day one” physics
 - v_1 probably not easily accessible in STAR FTPC.